Solve for:	Equation:
v_i	$x_f = x_i + v_i t + \frac{1}{2}at^2$
t, if $v_i = 0$	$x_f = x_i + v_i t + \frac{1}{2}at^2$
v_f	$a = \frac{v_f - v_i}{t}$
v	$K = \frac{1}{2}mv^2$
L	$T = 2\pi\sqrt{L/g}$
r	$F = \frac{Gm_1 m_2}{r^2}$

$$x_f = x_i + v_i t + \frac{1}{2}at^2$$
$$v_i t = x_f - x_i - \frac{1}{2}at^2$$
$$v_i = \frac{1}{t}\left(x_f - x_i - \frac{1}{2}at^2\right)$$

$v_i = 0$

$$x_f = x_i + \cancel{v_i t} + \frac{1}{2}at^2$$
$$x_f = x_i + \frac{1}{2}at^2$$
$$\frac{1}{2}at^2 = x_f - x_i$$
$$t^2 = \frac{2}{a}(x_f - x_i)$$
$$t = \sqrt{\frac{2}{a}(x_f - x_i)}$$
$$a = \frac{v_f - v_i}{t}$$
$$v_f - v_i = at$$
$$v_f = v_i + at$$
$$K = \frac{1}{2}mv^2$$
$$v^2 = \frac{2K}{m}$$
$$v = \sqrt{\frac{2K}{m}}$$

$$T = 2\pi\sqrt{\frac{L}{g}}$$

$$\left(\sqrt{\frac{L}{g}}\right)^2 = \left(\frac{T}{2\pi}\right)^2$$

$$\frac{L}{g} = \frac{T^2}{4\pi^2}$$

$$L = \frac{T^2 g}{4\pi^2}$$

$$F = \frac{Gm_1 m_2}{r^2}$$

$$\sqrt{r^2} = \sqrt{\frac{Gm_1 m_2}{F}}$$

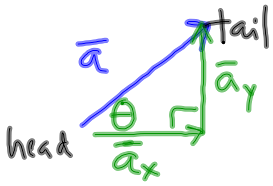
$$r = \sqrt{\frac{Gm_1 m_2}{F}}$$

VECTORS

Vectors	Scalars
- has two parts:	- has one part
magnitude (number)	magnitude
direction (+/- or compass direction and angle)	

Examples:

acceleration	speed
force	mass
velocity	energy
momentum	heat
displacement	time
	pressure
	angle
	distance



$\langle a_x, a_y \rangle$

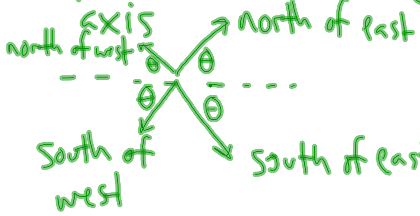
SOHCAHTOA

$\sin\theta = \frac{opp.}{hyp} = \frac{a_y}{a}$

$\cos\theta = \frac{adj.}{hyp.} = \frac{a_x}{a}$

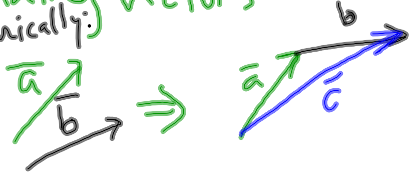
$\tan\theta = \frac{opp.}{adj} = \frac{a_y}{a_x}$

* always measure from horizontal axis

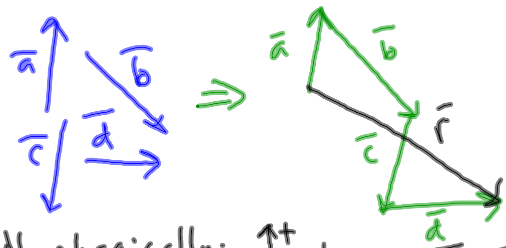


Adding Vectors:

Graphically:



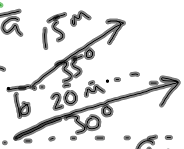
resultant vector: goes from head of the first to the tail of the last



Algebraically: ↑+ →+

15 m at 35° north of east

20 m at 30° north of east.



$\bar{a} + \bar{b} = \bar{c}$

$\cos\theta = \frac{a_x}{a}$

$a_x = a\cos\theta$

x-direction: $\bar{a}_x + \bar{b}_x = \bar{c}_x$

$a\cos\theta + b\cos\theta = c_x$

$(15\text{ m})\cos(35°) + (20\text{ m})\cos(30°) = c_x$

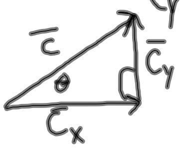
$c_x = 29.6\text{ m}$

y-direction: $\bar{a}_y + \bar{b}_y = \bar{c}_y$

$a\sin\theta + b\sin\theta = c_y$

$(15\text{ m})\sin(35°) + (20\text{ m})\sin(30°) = c_y$

$c_y = 18.6\text{ m}$



35 m at 32° north of east

↳ Pythag. thm. ↳ $\theta = \tan^{-1}\left(\frac{c_y}{c_x}\right)$